

## BEHAVIOR OF WILD FISH AND INVERTEBRATES IN THE LABORATORY

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During the past year, 34 species of fish and 12 species of invertebrates have been brought into our laboratory alive and observed for periods of several days to 12 months (Table 1). Most species were collected in bottom trawls off Palos Verdes and Dana Point and in Santa Monica and San Pedro Bays at depths of 25 to 150 m. Shiner perch were collected by hook and line, and white croaker, blue rockfish, wooly sculpin, and fluffy sculpin were collected by dip net.

The stress of capture by trawl was generally severe for most fish species, with mortality from collection and handling occurring within 3 days. Secondary mortality occurred in some specimens 1 to 2 weeks later and was often accompanied by the presence of lesions suggestive of an infectious bacterial or protozoan disease. Fishes surviving these stresses were maintained in the laboratory on a variety of foods including dried pellets; frozen and live brine shrimp; frozen squid, clams, and fish; and small live fish.

With the fish species, our primary laboratory objectives were to explore the fin erosion diseases of the Dover sole and white croaker through various experiments, to determine the effects of toxic metals on local species, and to observe differences in feeding behavior and relate these to hypotheses on community structure.

At first, emphasis was placed on returning a number of different flatfish species to the laboratory. We observed that there were variations both in the length of time required to adapt to aquarium conditions and in feeding behavior. When Dover sole began to acclimate to the laboratory, they no longer remained on the surface of the substrate and were buried a great deal of the time. Changing color to match the light color of the bottom sand was also a sign of acclimation. The Dover sole did not begin to feed on the pelleted diet until at least 3 to 4 weeks after capture, although those that were placed in tanks with individuals that were already feeding began to feed a little sooner.

Dover sole attacked the pelleted food primarily after it had reached the bottom and were inefficient at obtaining particles as they fell from the water surface; pellets that reached the bottom seldom escaped detection by this species. This behavior was easily distinguished from that of the speckled sanddab. These fish began feeding 1 to 2 days after capture and actively swam for food particles in the water column. Speckled sanddab feeding behavior resembles that described for other left handed flatfishes in aquaria in other laboratories.

With the invertebrate species, our primary objective has been to maintain the various organisms listed in Table 1 alive and active in the laboratory aquaria. We have maintained specimens in the lab for time periods ranging from several weeks for the sea slugs to 6 months for the shrimp species *Crangon nigromaoulata*.

We have observed that the shrimp *Crangon nigromaeulata* spend most of their time on or in the bottom sediments of the aquaria and are capable of moving through the substrate.

Egg cases of the squid *Loligo opalesoens* were brought into the laboratory from Catalina Island and were maintained in the aquaria for approximately three weeks. We were able to observe the maturation of the egg cases, the hatching of the tiny squid, and the early development of these juveniles. As the cylindrical, translucent white cases matured, they became opaque and bloated and floated upwards from the bottom. Just prior to hatching the tips of the cases turned brown. After the juvenile squid were released from the capsule, they were maintained for approximately 1 week on strained boiled egg yolk, on which they appeared to feed. After 2 or 3 days, the young squid were able to change color.

We also noted the commensal polychaetes, *Capitella ovincola*, living within the egg capsules; these worms did not appear to adversely affect the hatching of the juvenile squid. Approximately 20 of the *C. ovincola* were given to Dr. Donald J. Reish, and these are still maintained in his aquaria at California State University at Long Beach.

We conducted a preliminary toxicity experiment on the young squid to determine whether they could be used in our ongoing toxicity studies and concluded that they are potentially useful organisms for this purpose.

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## TABLES

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**Table 1.**

Fishes and invertebrates maintained in seawater aquaria.

Species	Common Name	No. Kept	Avg. Time Kept	Observed Feeding	
<b>Fish</b>					
Cephaloscyllium ventriosum	Swell shark	1	3 wk		
Synodus lucioceps	California lizardfish	1	5 mo	+	
Porichthys notatus	Plainfin midshipman	1	10 mo		
Chilara taylori	Spotted cusk-eel	1	3 mo	+	
Lycodopsis pacifica	Blackbelly eelpout		1-2 days		
Syngnathus californiensis	Kelp pipefish	1	1 mo	+	
Genyonemus lineatus	White croaker	3	2 wk	+	
Cymatogaster aggregata	Shiner perch	2	2 wk	+	
Zalembeus rosaceus	Pink seaperch		1 wk		
Alloclinus holderi	Island kelpfish	2	1mo	+	
Lepidogobius lepidus	Bay goby	2	1 wk		
Sebastes diploproa	Splitnose rockfish		1-2 days		
Sebastes jordani	Shortbelly rockfish		1-2 days		
Sebastes levis	Cow rockfish		1-2 days		

<i>Sebastes mystinus</i>	Blue rockfish	10	2 wk	+
<i>Sebastes saxicola</i>	Stripetail rockfish		1-2 days	
<i>Zaniolepis latipinnis</i>	Longspine combfish	2	1 mo	+
<i>Chitonotus pugetensis</i>	Roughback sculpin	3	4 mo	+
<i>Icelinus quadriseriatus</i>	Yellowchin sculpin	4	4 mo	+
<i>Clinocottus analis</i>	Wooly sculpin	40	2 mo	+
<i>Oligocottus snyderi</i>	Fluffy sculpin	1	2 mo	+
<i>Odontopyxis trispinosa</i>	Pygmy poacher	2	2 mo	
<i>Xeneretmus latifrons</i>	Blacktip poacher		1 wk	
<i>Citharichthys sordidus</i>	Pacific sanddab		1 wk	
<i>Citharichthys stigmaeus</i>	Speckled sanddab	9	12 mo	+
<i>Citharichthys xanthosigma</i>	Longfin sanddab		1-2 days	
<i>Hippoglossina stomata</i>	Bigmouth sole	1	4 mo	+
<i>Glyptocephalus zachirus</i>	Rex sole		1 wk	
<i>Microstomus pacificus</i>	Dover sole	15	4 mo	+
<i>Parophrys vetulus</i>	English sole	2	4 mo	
<i>Pleuronichthys coenosus</i>	C-O sole	2	3 mo	+
<i>Pleuronichthys decurrens</i>	Curlfin sole	1	4 mo	+
<i>Pleuronichthys verticalis</i>	Hornyhead turbot	2	4 mo	+
<i>Symphurus atricauda</i>	California tonguefish	4	5 mo	

Invertebrates				
Armina californica	Sea slug	2	1-2 wk	
Aeolida papillosa	Sea slug	1	1-2 wk	
Flabellinopsis iodinea	Sea slug	1	1-2 wk	
Polycera atra	Sea slug	1	1-2 wk	
Tritonia exsulans	Sea slug	3	1-2 wk	
Hermisenda crassicornis	Sea slug	3	1-2 wk	
Tegula aureotincta	Gilded turban shell	1	4 mo	
Loligo eggs	Squid	Many**	1 mo	+
Rossia pacifica	Squid	2	3 mo	
Crangon alaskensis	Shrimp	1		
Crangon nigromaculata	Shrimp	6	6 mo	+
Spirontocaris sp.	Shrimp	1	2 days*	+

\**Crangon nigromaculata* ate these animals.

\*\*40 capsules, each containing possibly 200 eggs.